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In 2001, an Institute of Medicine committee was charged to identify, review, and assess the current state of knowledge and policy responses pertaining to emerging microbial threats to health. Re-visiting the 1992 Institute of Medicine report, *Emerging Infections: Microbial Threats to Health in the United States*, the committee re-examined factors in emergence including: human demographics and behavior; microbial adaptation and change; technology and industry; economic development and land use; international travel and commerce; and breakdown of public health measures. Previously unrecognized factors were identified and evaluated for their impact on the emergence of infectious diseases. The committee assessed the capacity of the United States to respond to emerging microbial threats by identifying recommendations for domestic and international public health actions to strengthen the detection, response and prevention of emerging microbial threats.

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Table of Contents

INTRODUCTION

In its 1992 report "Emerging Infections: Microbial Threats to Health in the United States", the Institute of Medicine (IOM) pointed to major challenges for the public health and medical care communities in detecting and managing infectious disease outbreaks and monitoring the prevalence of endemic diseases. The recommendations of that report address both recognition of and interventions against emerging infections. It has provided the basis for the Centers for Disease Control and Prevention's (CDC) National Center for Infectious Diseases' 1994 and 1998 strategic plans to address the threat of emerging infections nationally. Other federal agencies then formalized their strategic plans, which incorporated many of the recommendations from the IOM report. The IOM report further served as a catalyst for the National Security Council to charge the Committee on International Science, Engineering, and Technology (CISET) of the White House National Science and Technology Council to consider the global threat of emerging and re-emerging infectious diseases. In 1994, the CISET Working Group on Emerging and Re-emerging Infectious Diseases was established under the co-leadership of CDC and the White House Office of Science and Technology Policy. It included representatives from more than 17 government agencies and departments. This group reviewed the U.S. role in detection, reporting, and response to outbreaks of new and re-emerging infectious diseases and made a number of recommendations, which are described in a report endorsed by President Clinton, "Infectious Diseases: A Global Health Threat" (NSTC/CISET, 1995). The principles and recommendations of the IOM report provided a focus for the CDC and CISET strategies.

Greater authority to implement the programs and activities of the CISET, CDC, and other federal agency and department strategies occurred in 1996 when President Clinton signed Presidential Decision Directive, PDD/NSTC-7. This is the first Executive Order specifically targeting infectious diseases, and it formally charged government agencies and departments with specific responsibilities and duties for the surveillance and response, research, education and outreach, prevention, and capacity building to combat emerging and re-emerging infectious diseases, domestically and internationally. Again, the 1992 IOM report recommendations on addressing emerging microbial threats to human health were reflected in PDD/NSTC-7. Both articulate a set of actions aimed at improving the U.S. public health infrastructure, and also working with other countries and international bodies to: prevent pandemics; strengthen global surveillance and response networks; stimulate research; provide training in clinical practice, public health management, and field epidemiology; and help develop local infrastructure to meet the global threat of emerging infections. Importantly, PDD/NSTC-7 serves as the foundation from which the U.S. Government enters into bilateral and multilateral negotiations with other governments and international bodies to address the threat of emerging infections. The most notable among these are the US-EU New Transatlantic Agreement, US-Japan Common Agenda, G7/8 Initiative, APEC, and several binational commissions led headed by Vice President Gore.

In a next step, the Centers for Disease Control and Prevention, along with the National Institutes of Health, asked the IOM to convene the Forum on Emerging Infections in order to continue the discussion of issues in the 1992 Emerging Infections report. In 1996, that IOM forum was established with support from several federal agencies, foundations, and pharmaceutical companies. It has conducted workshops on several aspects of infectious diseases: surveillance and response, diagnosis and treatment, drug resistance, research directions and priorities, and education and training.

Recent analyses by the National Security Council, the Center for Strategic and International Studies, and the Council on Foreign Relations have raised the profile of emerging infections, related security issues, and the impact on the US of high levels of morbidity and mortality. The timing is appropriate for a review of the basic science and the issues and challenges surrounding emerging infections, and development of a strategy to address issues of priority for the first decade of the 21st century.

BODY

Since the 1992 IOM emerging infections report, global integration of trade, commerce, and travel has introduced a range of problems that challenge solutions provided by individual agencies, governments, and markets to control infectious diseases. In recent years, the spread of HIV, the emergence of new diseases, and the resurgence of diseases once thought to be under control are together causing almost half of all deaths worldwide for people under the age of 45. The increased mortality and morbidity have broad social, economic, and environmental implications.

At the same time, there are advances in awareness and understanding of the causes of disease emergence and re-emergence, and in strategies for their control. For example, prescribing practices, patient behavior, agricultural and animal husbandry practices, and microbial evolution all contribute to increasing antimicrobial resistance. Infectious agents are becoming recognized as the cause of some chronic diseases. Prominent among these are gastric ulcers and atherosclerosis caused by *Helicobacter* and *Chlamydia*, respectively. Climatic and environmental factors can for contribute to outbreaks of diseases such as cholera, dengue, and malaria. Genome sequencing of pathogens and vectors, coupled with the refinement of polymerized-chain-reaction (PCR) amplification of DNA, development of PCR micro-chip array, and other rapid and automated diagnostic tools are expanding the field of molecular epidemiology and improving infectious disease surveillance. Similarly, intense efforts are underway to develop vaccines for malaria, HIV/AIDS, and other infectious diseases using increased knowledge of the genetic, molecular, and cellular basis of pathogenesis. New therapeutic measures and novel biomedical technology are addressing disease eradication. Polio has been eliminated from most of the western hemisphere, and may be eradicated globally by 2005. Measles, diphtheria, pertussis, tetanus, onchocerciasis, and dracunculiasis are targeted for eradication in the 21st century.

The recently completed study primarily address the status of emerging infections and the need for strategic investments in the United States. It also considered the global cooperation needed for infection disease surveillance, response, prevention, research, and training. The impact of emerging infections on human health and the social and economic structures of countries, particularly those least prepared yet most affected by infectious diseases were also be considered. Rather than address disease-specific recommendations, this study focused on improving and strengthening the public health capability to rapidly detect and respond to disease outbreaks, as this is the foundation for effective control of all infectious diseases.

Addressing these challenges will require the participation of academics, the biotechnology and pharmaceutical industries, policy makers, government agencies, international health organizations, not-for-profit health groups, and research and health officials in other countries.

Statement of Task

The committee will identify, review, and assess the current state of knowledge and policy responses pertaining to emerging infectious diseases. The committee will re-visit the 1992 Institute of Medicine report, *Emerging Infections: Microbial Threats to Health in the United States*, and re-examine factors in emergence including:

- human demographics and behavior
- microbial adaptation and change
- technology and industry
- economic development and land use
- international travel and commerce
- breakdown or lack of public health measures

Previously unrecognized factors will be identified and evaluated for their impact on the emergence of infectious diseases. The committee will assess the capacity of the United States to respond to emerging microbial threats to health and delineate unmet needs as a member of the global community. The committee will identify potential challenges and opportunities for domestic and international public health actions to strengthen the detection, response and prevention of emerging microbial threats.

Reportable Outcomes

Methodology

The duration of the study was approximately 21 months, terminating on March , 31, 2003. The methodology consisted of the following:

- Appointment of an 18 member, multi-disciplinary committee with expertise in microbiology, human and veterinary medicine, policy, industry, research, environmental health, and social and behavioral issues.
- Six committee meetings were held in Washington D.C. on September 4-5, 2001; November 6-7, 2001; February 21-22, 2002; April 24-25, 2002, June 20-21, 2002, and September 10-11, 2002.
- The committee collaborated with the IOM Forum on Emerging Infections to bring in experts to discuss the critical issues of bioterrorism preparedness, antimicrobial resistance, and the impact of globalization.
- Staff researched data requests by committee members, conducted literature reviews, and developed draft text under the guidance of the committee.
- Four papers were commissioned to review specific areas of importance to the study.
- Committee members gathered evidence, heard from experts in various pertinent fields, and drafted recommendation for better response and control of infectious diseases.
- A final report was released to the public on March 18, 2003

Dissemination Plan

The primary product of this study was a technical report, reviewed in accordance with NRC procedures. Expected audiences include the U.S. Department of Health and Human Services, state, tribal and local government agencies in all domains of public health, schools of public health, the research community, international health experts, and the legislative and policy communities. Sufficient copies of the report will be produced for distribution to the sponsor(s), the committee members and workshop attendees and major interested parties. Copies of the report summary will be produced for broader distribution, and made available on the Internet through the National Academy Press (www.nap.edu).

Elements of dissemination included briefings, press conferences, press announcements, public release meeting, special events for release (e.g., leadership dinner), conference sessions (e.g., at professional society meeting), targeted workshops, and Web site distribution. In addition, the IOM will seek to collaborate with the associations representing the major public health interests to disseminate the report findings and recommendations widely to their members, and to also reach out to state and local constituencies through organizations outside the public health community. New types of dissemination methods will be tested including potentially CDs, audiotapes, films. Separate funding will be sought from foundations for the expanded dissemination efforts.

APPENDIX A

COMMITTEE ON MICROBIAL THREATS TO HEALTH

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